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GAS-POWERED GUN

3,067,730

Filed Nov. 6, 1958

2 Sheets-Sheet 1

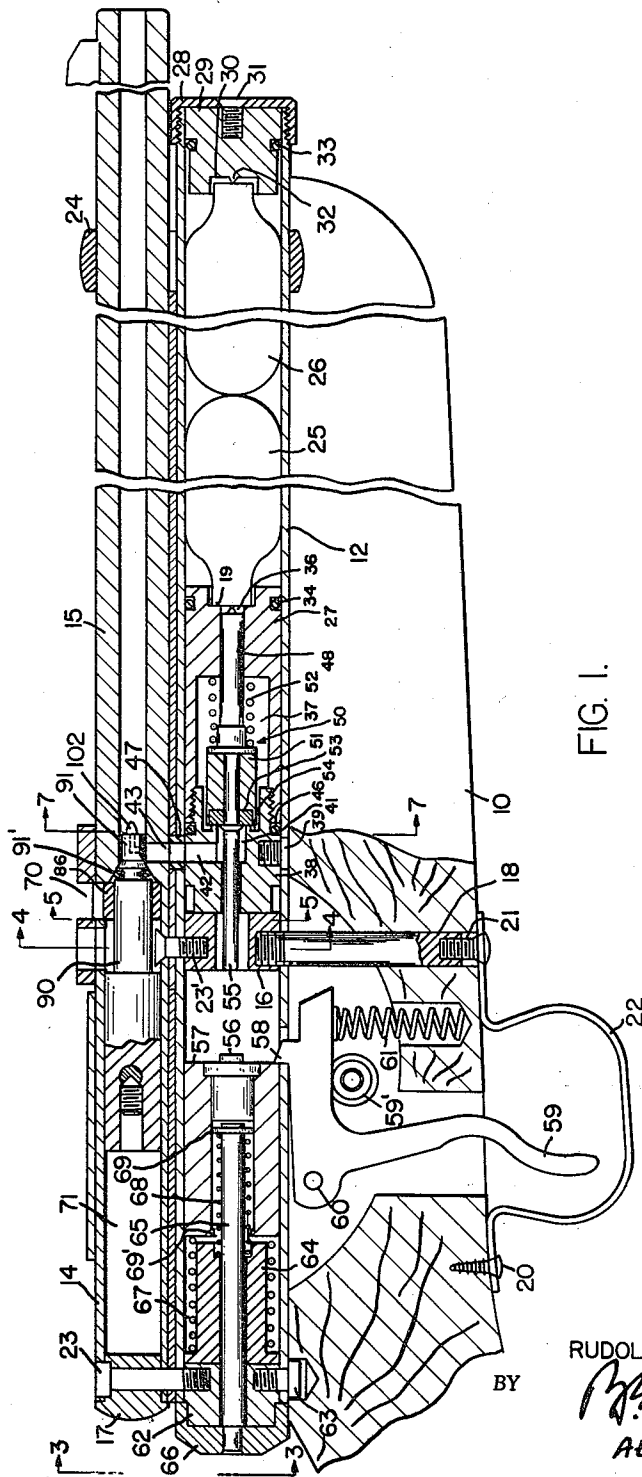


FIG. 1.

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2 Sheets-Sheet 2

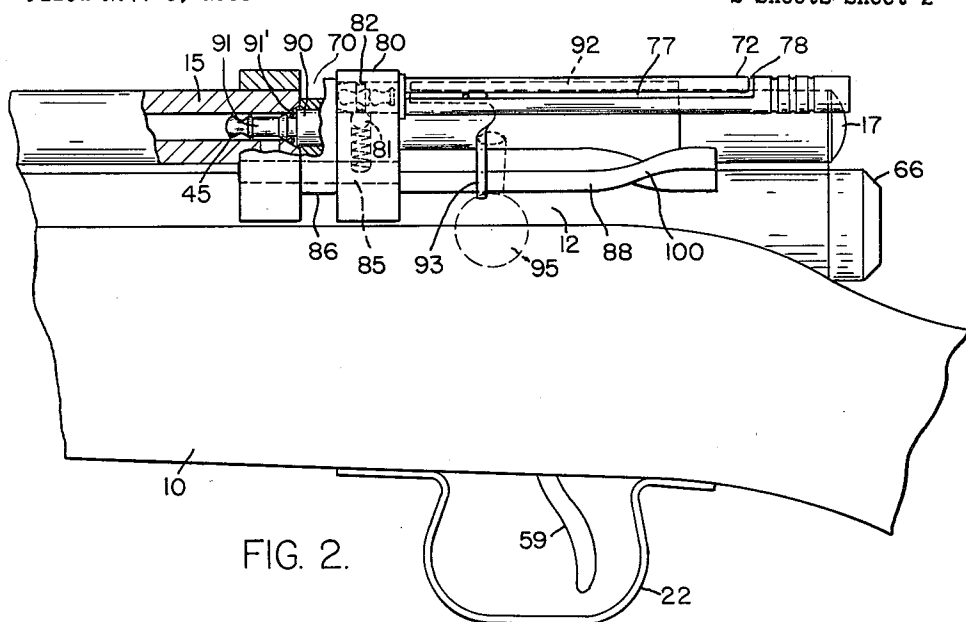


FIG. 2.

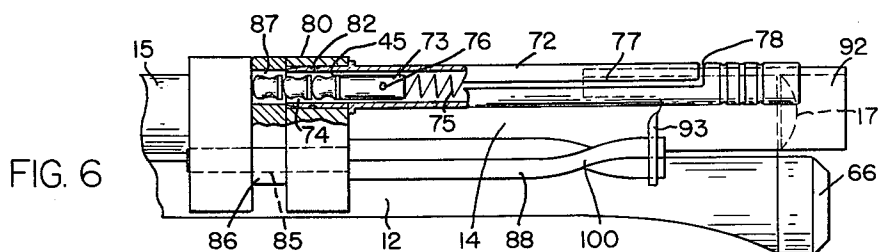


FIG. 6

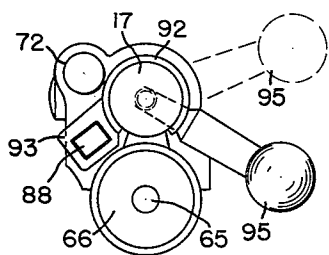


FIG. 3.

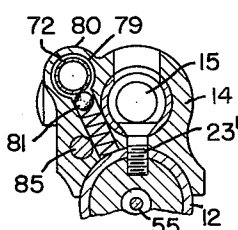


FIG. 4.

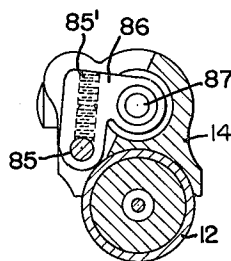


FIG. 5.

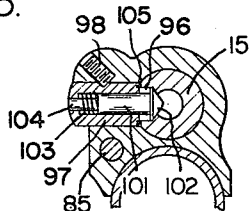


FIG. 7.

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3,067,730

GAS-POWERED GUN

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4 Claims. (Cl. 124—51)

This invention relates to gas-powered guns, and more particularly to an improved gas-powered gun of the type using a replaceable cartridge for supplying the gas which propels the projectile from the gun.

Gas-powered guns of this type have become increasingly popular with sportsmen for target shooting and small game hunting. This is partly because of their extreme accuracy and because a considerable number of pellets can be shot successively using gas supplied by replaceable cartridges. However, so far as bolt-operated guns of this type are concerned, heretofore, the projectiles which are usually in the form of skirted pellets, have had to be fed to the gun singly by hand.

One of the objects of this invention is to provide a gas-powered gun having an improved loading mechanism for successively loading pellets in the barrel of the gun in firing position.

Another object of this invention is to provide an improved gas-powered gun which has a bolt action loading mechanism for loading successive pellets from a magazine into the firing position in the barrel of the gun.

Another object of this invention is to provide an improved loading mechanism for a gas-powered gun which is simple in its construction, and definite and foolproof in its operation.

A further object of this invention is to provide an improved gas-powered gun which has a removably attached magazine for holding a plurality of pellets.

A still further object of this invention is to provide an improved gas-powered gun which provides maximum safety in operation and has means for detecting the presence of a pellet in firing position in the barrel of the gun.

Other objects of this invention will be apparent from the accompanying drawings, the specification, and the appended claims.

In the drawings:

FIG. 1 is a side elevation of one embodiment of the invention, with parts broken away to show the interior mechanism;

FIG. 2 is a fragmentary side elevation of the side of the gun opposite that of FIG. 1 with a portion broken away, and showing the breech bolt in firing position;

FIG. 3 is an end view of a portion of the gun taken at line 3—3 of FIG. 1 looking in the direction of the arrows;

FIG. 4 is a fragmentary cross-sectional view taken at line 4—4 of FIG. 1 and looking in the direction of the arrows;

FIG. 5 is a cross-sectional view taken at line 5—5 of FIG. 1 and looking in the direction of the arrows;

FIG. 6 is a fragmentary side elevation with parts broken away to show the interior of the magazine and showing the position of the mechanism with the breech bolt withdrawn; and

FIG. 7 is a fragmentary cross-sectional view taken at line 7—7 of FIG. 1 showing the indicating means for determining when a pellet is in firing position in the barrel.

The embodiment of the invention shown in the drawings is a gas operated pellet firing bolt action rifle, which has a reservoir for containing two conventional carbon dioxide cartridges, and a passage that connects this reser-

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voir with the breech end of the bore of the gun barrel. A normally-closed poppet valve is mounted in this passage. The hammer of the gun is adapted to be released, when the trigger is pulled, for opening the poppet valve to permit the flow of gas under pressure from the reservoir through the passage into the barrel of the gun to propel a pellet therefrom. The gun has a breech bolt which is adapted to be operated by a knob for transferring a pellet from a magazine into the barrel in firing position. The gun is cocked by manually pulling the hammer rearward to engage a sear of the trigger.

Referring in detail to the drawings, the gun comprises a stock 10 which supports an elongated hollow tube 12 upon which is mounted a tubular body member 14 having an elongated barrel 15 extending therefrom. The elongated tube 12 is attached to the stock 10 by an elongated threaded stud 18, which extends through the stock 10, and which is threaded at one end into a ring-shaped block 16, and which is secured at its other end by means of a screw 21 to the trigger guard 22. The trigger guard is secured to the stock 10 by the screw 21 and by a screw 20. The body 14 and the barrel 15 are secured on top of the tube 12 by means of a bolt 23, a screw 23' and a clamping band 24. Bolt 23 extends through a plug 17 that closes one end of body member 14, and threads into a plug 62 which is mounted in tube 12. Screw 23' threads into ring-block 16. Band 24 surrounds tube 12 and barrel 15.

The forward portion of the elongated cylindrical tube 12 is adapted to contain a pair of conventional, replaceable, carbon dioxide cartridges 25 and 26 (see FIG. 1). These are inserted in the forward or muzzle end of the tube with the cartridge 25 having its narrow neck portion extending rearwardly and engaging a plane surface 19 of the valve block 27 which will be described further hereinafter. The cartridge 26 is inserted in the tube 12 with its neck portion extending towards the forward or muzzle end of the tube. The forward end of the tube is closed by a cap 28. A block 29 is attached to the inner side of the cap 28 by a screw 31. It has a piercing projection 32 extending from a rear surface 30 for piercing the end of the cartridge 26 to release gas therefrom. The released gas is prevented from escaping from the forward end of the tube 12 by an O-ring 33 which is mounted in a peripheral recess in block 29. An O-ring 34, which is mounted in a peripheral recess in valve block 27, prevents gas from escaping from between the walls of the valve block 27 and the tube 12. Mounted in the tube 12 to seat at its rear end against the front face of the plug 16 is a valve block 38. This block threads at its front end into a recess or counterbore in block 27 that constitutes a chamber 37. A screw 39 which is threaded in the block 38 holds the blocks 38 and 27 in position in the tube 12. The valve block 27 has a bore 36 which communicates with the chamber 37. The block 38 has an axially extending passageway 41, which communicates with a radial passage 42. A sealing bushing 47 seals the joints between the passage 42 and a radial opening 43 which opens into the breach of the barrel 15. The threaded joints between the valve block 27 and the block 38 are sealed by an O-ring 46.

A poppet valve assembly 50 normally closes off communication between chamber 37 and passage 41. This assembly comprises a valve member 53 which is mounted in a counterbore in a block 51 and which is adapted to seat on a plane front seating surface formed on block 38. The poppet valve assembly 51 has a slidable piercing pin 48, which slides through the axial opening 36 in the valve block 27. The valve 51 is urged by a spring 52 so that its portion 53 sealingly engages the valve face 54 of the block 38. Extending axially from the valve 51

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toward the breech end of the gun is a rod 55 which is adapted to be struck by a projection 56 of a hammer 57 when the gun is fired, thereby causing the valve portion 53 to move away from its seat 54 to release gas from the chamber 37 through the openings 41 and 42 in the valve block 38, into the opening 43 to propel a skirted pellet 45 (see FIG. 2) from the barrel 15.

The hammer 57 is held in its cocked position as shown in FIG. 1 by a projection 58 of a trigger 59 which is adapted to pivot on a pin 60. The trigger 59 is urged constantly in a counterclockwise direction as viewed in FIG. 1 by a coil spring 61. A cylindrical block 62 is secured to the breech end of the tube 12 by a threaded bolt 63. Interposed between the hammer 57 and the block 62 is a cylindrical member 64 through which extends an axially slidable rod 65, one end of which is attached to a cap 66 which slidably fits over the block 62. The hammer 57 is constantly urged to firing position by a coil spring 67. To cock the gun the cap 66 is pulled rearwardly carrying the rod 65, and a flange 69 of the rod 65 engages a shoulder 69' of the hammer 57 to slide the hammer in the cylinder 12 against the force of the spring 67 until the projection 58 of the trigger 59 snaps in front of the hammer. A spring 68 constantly urges the rod 65 forward so that the cap 66 is held against the block 62 when the hammer 57 is cocked. A transversely slidable safety pin 59' prevents the actuation of the trigger 59 when in contact with the trigger.

The pellets, such as 45, which are to be fired are contained in a replaceable magazine 72 (see FIGS. 2 and 6). The magazine 72 is loaded through an opening 74 in front of a slidable plug 73 which urges the column of pellets 45 out of the opening 74 under actuation of a coil spring 75. During loading of the magazine 72, the plug 73 is moved rearwardly by an attached pin 76 which extends into a slot 77. The plug 73 is held in its rearward position by inserting the pin 76 into a slot 78. The magazine 72 is adapted to be inserted in a bore 79 (see FIG. 4) in a protruding portion 80 of the body 14. It is removably held in this bore 79 which communicates with a slot 70, by a spring loaded detent 81 (see FIG. 4) which engages an annular groove 82 in the front portion of the magazine.

Pivotally mounted on a pin 85 in the slot 70 formed between the barrel and the body is a transfer arm 86 which has an axial opening 87 (see FIGS. 5 and 6). The arm 86 is secured to the pivot pin 85 by set screws 85'. The transfer arm 86 is so mounted that its opening 87 is adapted to be selectively aligned with either the magazine 72, or with the bore of the barrel 15. Axially extending from the pivot pin 85 and rigidly attached thereto is an elongated bar 88 of rectangular cross-section which has a helical twisted portion for part of its length, and which extends rearwardly alongside the body 14 and the tube 12 beneath the magazine 72.

A breech bolt 90 having a transversely extending bolt knob 93, is slidably mounted in a bore 71, and has a forward portion 91 of reduced diameter which is adapted to enter the barrel 15 when in a forward firing position. An O-ring 91' prevents gas from escaping from between the bolt and the barrel when the gun is fired. Slidably mounted about the body 14 is a sleeve 92, to which is attached a tang 93 which has an opening of rectangular cross-section corresponding to the cross-section of the bar 88, and through which the bar 88 slidably extends. The bolt 90 is rotatable relative to the sleeve 92 so that when the bolt 90 is in its extreme forward position with its reduced portion 91 extending into the barrel 15 through the opening 87 in the transfer arm 86, the knob 93 can be rotated a predetermined distance in a clockwise direction (see FIG. 3) to lock the bolt in position. The counterclockwise rotation of the bolt 90 relative to the sleeve 92 to the position shown by the dotted lines of FIG. 3 permits the breech bolt 90 to be withdrawn from the bar-

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rel 15 and the opening 87 in the transfer arm 86. When the bolt is moved rearwardly it carries the slide 92 rearwardly with it so that its tang 93 slides along the rectangular rod 88. The sliding of the bolt 90 and the slide 92 does not affect the position of the transfer arm until the tang 93 reaches the twisted portion 100 of the bar 88, at which time the tang 93 causes the rectangular rod 88 and the transfer arm 86 to rotate to shift the opening 87 in the transfer arm from registry with the barrel to registry with the magazine opening 74. As the transfer arm 86 is wide enough from front to rear to receive but one pellet, and the front face of the transfer arm slides with close tolerances between the walls of the slot 70, only one pellet 45 can get into the bore 87 at one time. When the bolt 90 is pushed forward in the bore 71, the tang 93 in cooperation with the twisted bar 88 pivots the transfer arm 86 to the position wherein its opening 87, which is now carrying the pellet 45, is aligned with the barrel 15. The other pellets in the magazine are held therein by the solid rear surface of the transfer arm 87 which blocks the opening 74 of the magazine when the opening 87 is not in alignment with the magazine. In the further forward movement of the bolt 90, it enters the opening 87 of the transfer arm 86, pushing the contained pellet 45 into the barrel 15 in firing position. The bolt knob 93 is then rotated downwardly relative to the sleeve 92 to the full line position shown in FIG. 3 to lock the bolt 90 in firing position. After the gun is fired the knob 93 is rotated upwardly (FIG. 3) to unlock the bolt, and the bolt is moved rearwardly causing the transfer arm 87 to pivot when the tang 93 contacts the twisted portion 100 of the bar 88, thereby again to align the opening 87 with the magazine 72. The spring 75 (FIG. 6) then pushes the foremost pellet out of the magazine to again load the transfer arm 86; and the knob 93 is then pushed forward causing the breech bolt 90 to push a pellet 45 out of the transfer arm opening 87 into the barrel 15 ready for another firing.

Referring to FIG. 7, there is an opening 96 which extends transversely through the wall of the barrel 15 (see FIG. 1), at a point slightly ahead of the breech bolt 90 when the breech bolt is in firing position. A bushing 97 is secured in the opening 96 by a set-screw 98. An indicator pin 101 having an inner conical head 102 is adapted to slidably fit in the interior of the bushing 97 and is constantly urged transversely into the barrel 15 by a spring 103. The pin 101 has a projection 104 which extends outward beyond the outside surface of the barrel of the gun when a pellet 45 is in firing position in the barrel. It is apparent that as the breech bolt 90 is moved forward the pellet 45 engages the conical face 102 and pushes the pin 101 against the pressure of the spring 103 so that the projection 104 of the pin 101, which may be painted a contrasting color such as yellow, is visible to the operator. The projecting portion 104 of the pin 101 can also be detected with the hand. Gas is prevented from escaping through the opening 96 by a gasket 105.

In operation, the cap 28 is removed from the forward end of the tube 12 and a gas cartridge 25 is inserted in the tube so that its neck portion rests against the surface 19 of the valve block 27. Another cartridge 26 is inserted in the barrel so that its neck portion extends towards the muzzle of the gun. The cap 28, to which is attached a block 29, is then threaded to enclose the forward opening of the tube 12. The cocking cap 66 is then pulled rearwardly cocking the hammer 57, and the trigger 59 is operated to release the hammer 57 thereby causing the pin 48 to pierce the rear face of the cartridge 25, and also shove the cartridge 25 against the cartridge 26 so that its forward face is pierced by the projection 32. Gas from the cartridges 25 and 26 now fills the interior of the tube 12 between the valve block 27 and the block 29. The escaping gas also fills the chamber 37, and helps to overcome the force of the spring 67

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which causes the spring 52 to snap the valve 53 closed at this time before gas can escape from the chamber 37 into the barrel.

The breech bolt 90 is now moved to its forward position and locked therein. A magazine 72 containing a plurality of pellets 45 is inserted into the opening 74 of the block 80. The pin 76 is then released from its groove 78 permitting the column of pellets 45 to be urged against the transfer arm 86. The bolt is then rotated upward by its handle 95 and pulled rearwardly which causes the breech bolt 90 to withdraw from the barrel 15 and the opening 87 of the transfer arm, and then causes the tang 93 of the slide 92 to pivot the transfer arm 86 so that its opening 87 aligns with the opening 74 of the magazine 72. This causes the foremost pellet to enter the opening 87 in the transfer arm. The bolt 90 is then moved forward. This pivots the transfer arm 78 so that its opening realigns with the barrel 15. Then the forward end of the breech bolt 90 moves through the opening 87 of the transfer arm 86 to push the pellet 45 into the barrel 15 to firing position. The presence of the pellet in firing position pushes the projection 104 outward of the barrel thus indicating that the gun is ready to be cocked. The cap 66 is then pulled rearwardly until the projection 58 of the trigger snaps in front of the hammer. The trigger 59 is then operated, which releases the hammer 57 causing its projection 56 to strike the pin 55 releasing the gas from the chamber 37, so that it flows through the passages 42 and 43 into the barrel behind the pellet 45, thereby propelling the pellet 45 from the barrel.

To fire subsequent pellets from the gun, the same operation is repeated. After the pellets in the magazine have been exhausted, the magazine is removed from the opening 79 by pulling it rearwardly against the pressure of its spring-loaded detent 81.

It should be pointed out that the gun described may be in various conditions of readiness to fire with absolute safety. For example, in transporting the gun with gas pressure in the tube 12, the magazine 72 can be removed from the gun and the bolt put in its full rearward position. Thus, the operator can readily see by the position of the projecting indicator 104 that no pellets are in firing position. When the operator is at the site of target practice or in the hunting grounds, and he desires to have his magazine in position but is not yet ready to fire, he can leave the bolt 90 drawn rearwardly to its fullest extent, and again rely on the indicator to determine the presence of a pellet in firing position. In the event that a pellet should be in firing position, with the breech bolt in its withdrawn position, the hammer may be in its uncocked position thus preventing an inadvertent firing of the gun. Even if the gun should be inadvertently fired with the bolt drawn, the escaping gas will exhaust into the slot 70 without exerting pressure against the pellet 45 in the barrel.

Under circumstances where it is desirable to have a pellet in firing position so that the gun may be fired at an instant's notice, the hammer 57 may be left uncocked until firing. In the event that the operator of the gun changes his mind about firing after the gun is cocked, he may pull the breech bolt rearwardly thus withdrawing the bolt from firing position, and then pull the cap 66 rearwardly to its limit position, and after pulling back on the trigger slowly, releasing the hammer so that the gun will again be in its uncocked position.

The indicating mechanism which determines the presence of a pellet in firing position is not only useful as a safety feature, but prevents the needless waste of propelling gas in the event that the operator assumes that the gun is loaded and ready for firing when actually there is no pellet in firing position.

Although the invention is shown in the form of a bolt action repeating rifle, it may be embodied in a pistol or any other type of gas operated gun. It is also apparent that it is not necessary to use two metallic cartridges to

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provide the supply of gas, but that only one gas cartridge may be used if desired.

While the invention has been described in connection with a specific embodiment thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains and as may be applied to the essential features hereinbefore set forth, and as fall within the scope of the invention or the limits of the appended claims.

Having thus described my invention, what I claim is:

1. A gun comprising a body, a barrel secured thereto, said body having a slot therein extending transversely to said barrel, and the breech end of said barrel communicating with said slot, a magazine attached to said body for holding a plurality of missiles in columnar relation, said magazine having a delivery opening communicating with said slot at a point laterally spaced from the breech end of the barrel, spring means in the magazine constantly urging missiles out of the delivery opening, a rod extending parallel to the axis of the barrel and rotatably mounted in said body, a transfer member positioned in said slot and rigidly fastened to said rod to pivot transversely to the barrel when said rod is rotated, said transfer member having a pocket therein for holding a single missile, and an actuating member reciprocable in said body parallel to said rod, means connecting said actuating member to said rod for rotating said rod in opposite directions upon movement of said actuating member in opposite directions, respectively, thereby to pivot said transfer member from a position in which said pocket registers with said delivery opening to a position where said pocket registers with said breech end, and vice versa, and means connected to said actuating member to move a missile out of the pocket of the transfer member into the breech end of the barrel when said pocket registers with said breech and said actuating member is at the end of its stroke in one direction.

2. A gun comprising a body, a barrel secured thereto, said body having a slot therein extending transversely of said barrel and the breech end of said barrel communicating with said slot, a magazine attached to said body for holding a plurality of missiles in columnar relation, said magazine having a delivery opening communicating with said slot at a point laterally spaced from the breech end of the barrel, spring means in the magazine constantly urging missiles out of the delivery opening, a rod extending parallel to the axis of the barrel and rotatably mounted in said body for rotation about an axis extending parallel to said barrel axis, said rod being straight for a portion of its length and helical for another portion of its length, a transfer member positioned in said slot and rigidly fastened to said rod to pivot transversely to the barrel about an axis parallel to the axis of said barrel when said rod is rotated, said transfer member having an aperture extending therethrough to define a pocket for holding a missile, and an actuating member movable parallel to the axis of said barrel and having means thereon engageable with said helical portion of said rod for rotating said rod in opposite directions, respectively, upon movement of said actuating member in opposite directions, respectively, thereby to pivot said transfer member from a position in which said pocket registers with said delivery opening of the magazine to a position where said pocket registers with the breech end of the barrel, and vice versa.

3. A gun comprising a body and a barrel extending from said body, said body having a breech bore behind the breech end of said barrel and axially aligned with said barrel, said body having a slot between the breech end of said barrel and said breech bore extending transversely to the axis of said barrel and the breech bore, a

magazine attached to said body for holding a plurality of missiles in columnar relation, said magazine having a delivery opening communicating with said slot at a point laterally spaced from the breech end of the barrel, spring means in the magazine constantly urging missiles out of the delivery opening, a transfer member positioned in said slot and having a pocket for holding a missile, said transfer member being pivotal on said body on an axis parallel to but offset from the axis of the barrel for movement in opposite directions from a position wherein said pocket registers with said delivery opening to a position wherein said pocket registers with said barrel, and vice versa, a breech bolt reciprocable in said breech bore axially of the barrel, and lost-motion means connecting said breech bolt to said transfer member to pivot said transfer member in opposite directions upon movement of said breech bolt in opposite directions, said breech bolt passing through said pocket to force a missile out of said pocket and to close the breech end of said barrel when said pocket registers with said barrel, said lost-motion connection insuring the breech bolt is out of said pocket and wholly within the breech bore during actual pivotal movement of said transfer member, said lost motion means comprising a rod rigidly connected to the transfer member and extending in axial alignment with the pivotal axis of said transfer member, said rod being straight for a portion of its length and helical for another portion of its length, and a tang carried by said breech bolt and slidable axially along said rod during movement of the breech bolt in opposite directions.

4. A gun comprising a body, a barrel secured thereto, said body having a slot therein which is bounded at front and rear by parallel side walls that extend transversely to said barrel, the breech end of said barrel communicating with said slot, a magazine attached to said body for holding a plurality of missiles, said magazine having a delivery opening at one end communicating with said

slot at a point spaced laterally from the breech end of said barrel, a transfer member positioned in said slot to pivot transversely to said barrel and having a pocket extending therethrough from front to rear of said slot for holding a missile, a bolt mounted in said body in axial alignment with said barrel and rearwardly of said barrel to reciprocate axially of said barrel, and means connecting said bolt to said transfer member to pivot said transfer member from a position in which said pocket registers with said delivery opening to a position where said pocket registers with said breech end upon forward movement of said bolt, and vice-versa upon rearward movement of said bolt, said bolt being positioned so that at the forward limit of its movement it enters said pocket to move said missile from said pocket into said barrel, and said connecting means comprising a rod pivotally mounted in said body to extend in a direction generally parallel to the axis of said barrel and being helical for a portion of its length, and a tang secured to said bolt to engage and slide along said rod as said bolt is reciprocated.

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